

EXPLANATION OF PLATES XXXI-XXXIV.

PLATE XXXI.

- Figs. 1-4. Young plants of *L. cernuum*. 1, $\times 7$; 2, $\times 7$; 3, $\times 6$; 4, $\times 3$.
 Figs. 5-9. Young plants of *L. laterale*. 5, $\times 5$; 6, natural size; 7, $\times 3$; 8, $\times 3$; 9, $\times 1\frac{1}{2}$.
 Figs. 10-13. Young plants of *L. volubile*. 10, 11, and 12, natural size; 13, $\times \frac{3}{2}$.
 Fig. 13a. Showing dorsi-ventrality and heterophylly in leaf-arrangement of *L. volubile*.
 Figs. 14-15. Young plants of *L. scariosum*. Natural size.
 Figs. 15a, 15b. Showing dorsi-ventrality and heterophylly in leaf-arrangement of *L. scariosum*.
 Fig. 16. Young plant of *L. densum*. $\times \frac{1}{2}$.
 Figs. 17-19. Young plant of *L. Billardieri*. Natural size.

PLATE XXXII.

- Fig. 1. Portion of stele of mature stem of *L. volubile*, showing banded arrangement. $\times 175$.
 Fig. 2. Stele of young plant of *L. volubile*, 1 cm. high. $\times 225$.
 Fig. 3. Stele of young plant of *L. scariosum*, $1\frac{1}{2}$ cm. high. $\times 175$.
 Fig. 4. Portion of stele of mature stem of *L. cernuum* just behind apex, showing mixed arrangement. $\times 80$.
 Fig. 5. Apex of adventitious root of *L. volubile*. $\times 125$.
 Fig. 6. Showing piliferous layer behind apex of adventitious root of *L. volubile*. $\times 175$.
 Fig. 7. Apex of terminal branchlet of *L. densum*. $\times 200$.
 Fig. 8. Apex of young strobilus of *L. volubile*. $\times 200$.
 Figs. 9-11. Three consecutive longitudinal sections of stem of *L. volubile*, showing dichotomous branching. $\times 175$.

PLATE XXXIII.

- Fig. 1. Photomicrograph of stele of *L. laterale*. $\times 95$.
 Fig. 2. Photomicrograph of stele of *L. cernuum*. $\times 38$.
 Fig. 3. Photomicrograph of stele of *L. volubile*. $\times 57$.

PLATE XXXIV.

- Fig. 1. Photomicrograph of stele of *L. scariosum*. $\times 49$.
 Fig. 2. Photomicrograph of stele of *L. densum*. $\times 47$.
 Fig. 3. Photomicrograph of stele of *L. Billardieri*. $\times 95$.

ART. XLVII.—*A List of the Known Fishes of Kermadec and Norfolk Islands, and a Comparison with those of Lord Howe Island.*

By EDGAR R. WAITE, F.L.S., Curator, Canterbury Museum.

[Read before the Philosophical Institute of Canterbury, 3rd November, 1909.]

As a member of a small party, Mr. W. R. Oliver spent about nine months during 1908 at the Kermadec Islands, and incidentally made a collection of fishes, which he placed with me for examination. Though small, the collection is interesting, from the circumstance that very few fishes were definitely known from the group; in fact, the only references I have encountered, other than those recorded by the "Challenger" expedition (see concluding paragraph), are to *Gymnothorax eupterus* and *Scorpena cooki*, both described from Raoul Island (Sunday Island) by Günther, though since recognised elsewhere.

Mr. Oliver explains that no serious attempt was made to secure a representative collection of the fishes; arrangements projected for obtaining a better series being frustrated by the unexpected early arrival of the Government steamer, which makes but an annual call at the Kermadec Islands.

The group lies on meridian 178 of west longitude, and the 30th parallel of south latitude passes through it. Norfolk Island lies in the same latitude, but considerably to the westward, the longitude being 168° 1' east. Still further to the west, in longitude 159° 5' east, is Lord Howe Island; this island has a rather more southerly position, the latitude being 31° 33' south. As the temperature of the water, or the food-supply which it maintains, is an important factor in the geographical distribution of fishes, a comparison of the fauna of the three islands mentioned, lying as they do in approximately the same parallel, may be of some interest.

Unfortunately, the fish fauna of the islands is very imperfectly and unequally known, for, while that of Lord Howe Island has been tolerably exploited, our knowledge of the fishes of Norfolk Island and of the Kermadec Group rests upon meagre records, which are here presented for the first time in collected form.

KERMADEC ISLANDS.

As above mentioned, Günther has recorded two fishes from Raoul Island—namely, *Muraena cuptera** and *Scorpaena cooki*.† In his account of the Kermadec Islands, Mr. Percy Smith‡ writes, "Fish abound round the coast in great quantities. We caught hapuka (*Polyprion prognathus*)§ of great size; a variety of kahawai (*Arripis trutta*), a very handsome fish; kingfish, or yellow-tail (*Seriola lalandi*), a delicious fish, very superior for eating to our New Zealand species; and trevalli (*Caranx platessa*); besides others whose names I have no idea of." I have not come across further records, and the following is a complete list of the fishes obtained by the party. Mr. Oliver has supplied me with a few field notes, and these have been made use of where they appear to be of interest.

Among the most interesting forms are those which were previously known only from either Norfolk or Lord Howe Islands, including *Machirope latispinis*, Ogilby: *Acanthistius cinetus*, Günther; *Cantherines analis*, Waite; and *Limnichthys fasciatus*, Waite: while of special note is that interesting Paralepid, *Lestidium nudum*, Gilbert, previously known from a single example taken in the Hawaiian Islands. Examples identified with *Lampanyctus guntheri*, Goode and Bean, are described; while the following are regarded as new, and are herein figured: *Gonostoma raoulensis*, *Muraenichthys oliveri*, *Pempheris analis*.

An examination of the recorded species may show a slight excess of Australian over New Zealand forms; but in the majority of cases they are common to both areas, while many have a much wider range. It would appear, however, that the Kermadec, Norfolk, and Lord Howe Islands have much in common as regards the fish fauna, and that some interesting types have been developed in these groups. It is to be hoped that further collections may be made in the neighbourhood of the Kermadec and Norfolk Islands, so that a more satisfactory comparison may be made.

Carcharias (Rafinesque), sp.

Mr. Oliver says that sharks are fairly common during the summer months, and were taken off Fishing Rock, on Sunday Island. Young ones were caught from the beach. Specimens were not preserved, but Mr. Oliver

* Günther, Cat. Fish. Brit. Mus., viii, 1870, p. 122.

† *Id.*, "Fische der Sudsee," 1874, p. 78, pl. lv.

‡ Smith, "The Kermadec Islands," 1887, Wellington, p. 22.

§ I have supplied the probable scientific names.

has supplied notes and sketches which enable me to refer the shark to the genus *Carcharias*. The absence of black on the fins removes it from possible alliance with the common Pacific *C. melanopterus*. I recorded *C. menisorrah* from Lord Howe Island, and found it to be as common there as the species noticed by Mr. Oliver at the Kermadec Islands.

The shark which Mr. Moseley mentioned as having been caught with four or five pilot-fish about it was supposed by Dr. Günther to be *C. lamia*.*

Lampanyctus guntheri, Goode and Bean.

D. 13; A. 13; V. I, 8; P. 16; C. 19 + 12. L. lat. 38; L. tr. 2-4.

Length of head, 3.3; height of body 5.2 in the length; eye, 3.1; inter-orbital space, 4.6; and length of snout, 5.6 in the head.

Preopercle very oblique, the angle acute, the mouth large, subhorizontal, the maxilla extending to the preopercular angle.

The dorsal fin arises midway between the front margin of the eye and the base of the caudal, the length of its base 1.7 in the head; adipose fin present, immediately behind the vertical of the anal; the anal commences beneath the last ray of the dorsal, and its base is slightly less than that of the dorsal; the ventral lies beneath the second ray of the dorsal, and just reaches to the anal fin; the pectoral is very long, longer than the head, and it reaches to the middle of the anal; the caudal is deeply forked, its length being 1.3, and the least depth of its peduncle 3.6 in the head.

The scales are smooth, those of the lateral line scarcely enlarged. Luminous scales are also present on the hinder part of the caudal peduncle above, and below they extend from the anal fin to the caudal; apparently luminous scales also exist before and behind the dorsal fin; the nostril and the margin of the preopercle likewise seem to be luminous.

The photophores lie as follows:—Opercular: 3, close behind the margin of the preopercle. Pectoral: 3, one below the lateral line, one on the base of the fin, and the third above the second thoracic. Antero-lateral: 1 above the base of the ventral fin. Medio-lateral: 3, the upper one on the lateral line above the first anal ray. Postero-lateral: 2, the upper just below the lateral line over the last anal ray. Thoracic: 5, the last slightly raised and at the base of the ventral. Ventral: 5, the first and fourth below the others, and the fifth beneath the lowest medio-lateral. Anal: 11, the first the lowest, a wide break between the sixth and seventh at the base of the last anal ray. Caudal: 4, the last just below the lateral line.

The colours are of the dark hue usual with Myctophids, the dorsal, anal, and caudal being dotted, the dots forming closely set bars.

Eight specimens, washed ashore. The only example before known appears to be the type, taken off Newfoundland.

Length, 60 mm.

The points in which the specimens differ from the description of *L. guntheri* are so slight that I decide to refer them to that species, and indicate the ascertainable differences.

In the Kermadec Island examples there is but one antero-lateral photophore in place of two, and the anals number 6 + 5 as against 5 + 5. The dorsal fin also appears to have a slightly more forward position.

Two misprints in the original account, which have been copied by subsequent writers, may be here corrected: "Dorsal origin a little nearer

* Chall. Rep., Summary, pt. i, p. 617.

to tip of snout than to root of ventral"; for "ventral" read "caudal."
 "Postero-laterals in advance of the first dorsal"; for "first dorsal" read
 "second dorsal."

Gonostoma raoulensis, sp. nov. Plate XXXV, fig. 1.

D. 10; A. 10; V. 6; P. 11; C. 8 + 15; Sc. 38, Sc. tr. 9.

Length of head, 3.8; height of body, 5.4 in the length; diameter of eye, 3.4; and interorbital space, 5 in the head.

Head compressed, lower jaw the longer; the maxilla extends beyond the eye, and is toothed to its extremity; the mouth is large, and the teeth in the jaws are canine-like, of unequal size; there are teeth on the palatines, but none on the vomer. No pseudobranchiæ. Gills, 4; gill-rakers long and slender, 18 on the first arch, 13 being on the lower limb.

Body compressed. The dorsal fin commences midway between the middle of the eye and the base of the caudal; the length of its base is one-fifth less than the head; adipose fin present; the anal fin commences below the hinder third of the dorsal, and has a shorter base; the ventral fin lies midway between the end of the snout and the base of the caudal; the pectorals are inserted low, and extend more than half their distance from the ventrals; the caudal is forked, and the depth of the peduncle is less than the diameter of the eye.

The scales are large, thin, and cycloid; and on the head are present, on the opercles at least, no certain traces of lateral line.

The sides are silvery, the upper edge dark brown as far as the hinder insertion of the dorsal; dots behind the adipose fin, also at the base of the caudal peduncle; upper part of head spotted: all the fins colourless.

The photophores are arranged thus:—Preorbital: 1, immediately in front of the eye. Suborbital: 1, at the lower hinder angle. Opercular: 1 on the edge of the preopercle, 2 behind its angle, about 12 on the inner side of the opercles, continued forward towards the symphysis of the lower jaw. Mandibular: a pair at the symphysis, and 8 pairs on the isthmus—that is, a series of 8, and a corresponding series on the other side of the ventral line. Thoracic: 16 true pairs (as above), the anterior one beneath the gill-cover; also an upper series of 12 lying close above the hinder 12 pairs. Ventral: 10 pairs, an upper series of 11, the extra one lying above the ventral fin; the whole upper row thus forms an unbroken series of 23 photophores. Anal: 13 or 14 pairs, less regularly disposed, posterior to the fin. Caudal: none, unless the last 2 of the anal series, which are slightly separated, be so regarded.

Length, 41 mm.

The differences between *Gonostoma* and *Phosichthys* were indicated by Goode and Bean,* and Günther† has given an excellent figure of *P. argenteus*, that by its author being incorrect, illustrating two rows of photophores above and beyond the anal fin, instead of one row only.

Gonostoma microdon, Günther, also recorded from New Zealand, has been made the type of the genus *Cyclothone*, Goode and Bean, differing in absence of scales and usually the adipose fin also. The luminous spots are less conspicuous than in *Gonostoma*.

Maurolucus australis, Hector, is generically distinct, and will be diagnosed in a later paper.

* Goode and Bean, *Oceanic Ichth. Mem. Mus. Harv. Coll.*, xxii, 1896, p. 104.

† Günther, *Chall. Rep.*, xxii, 1887, pl. xlv, fig. A.

Lestidium nudum, Gilbert. Bull. U.S. Fish Comm., xxiii, 1905, p. 607, fig. 236.

This fish was previously known only from the type specimen, taken in the Hawaiian Islands; it was obtained in the trawl, operating at a depth of 283 to 284 fathoms, but Dr. Gilbert thinks it may have been captured near the surface. It measures 200 mm. in length, and is fully described and figured.

Mr. Oliver has placed three specimens of this interesting species in my hands. They were washed on to Denham Bay beach, on Sunday Island, in July last year, and are in very good condition. They have the appearance of immaturity, no colour-markings being developed; they are smaller than the type, being respectively 129 mm., 109 mm., and 105 mm. in length.

The radial formulæ, in the order given, is as follows: D. 12, 10, 10; A. 29, 31, 32. The other fin-rays are as in the type, and in every case the scales in the lateral line number 68.

Gonorhynchus gonorynchus, Linn.

Several small examples are included in the collection; they were washed up on to the beaches, and are all similar to the young ones I have previously described,* which therefore represent the normal coloration of immature specimens. A large example, taken in this province, and preserved in the Museum, measures 384 mm. in length.

Congrellus, sp.

Several small *Leptocephalid* eels are recognised as of this genus, but it is not possible to identify them specifically. There are also a number of larval forms, possibly of different genera, entered in the comparative list as *Atopichthys*.

Murænichthys oliveri, sp. nov. Plate XXXV, fig. 2.

Head acute, 11.5 in the total length; anterior nostril in a tube close to the lip, and just above the tip of the mandible; posterior nostril a large pore, midway between the anterior one and the angle of the mouth, also close to the lip; cleft of mouth one-fifth the length of the head, extending posterior to the eye; the latter small, 3.3 in the length of the snout. Gill-opening very small, a vertical slit, subventral in position. Teeth in the jaws, on the vomer and palatines. A row of large pores along the margin of the upper lip and another from the snout passing over and behind each eye; a transverse series of 5 pores across the upper anterior half of the head; the lowest pore on each side forms the first of the lateral series, which to the number of 135 passes along the middle of the side to within a head-length of the caudal; this series is arched on the head, and there are 67 pores anterior to the vent. Head and body together a little shorter than the tail. Body worm-like, its depth about $\frac{1}{3}$ the total; tail not compressed. Dorsal fin low, arising exactly in the middle of the length and a short distance posterior to the vent; anal similar to and arising slightly in front of the dorsal, and uniting with it round the end of the tail.

Colours.—Olive-brown above, the tint formed of closely placed spots, which are more widely spaced on the sides; lower parts immaculate.

Length of specimen, 207 mm.

* Waite, Rec. Aust. Mus., v, 1904, p. 147.

Gymnothorax thyrsoidea, Richardson.

A single specimen was preserved by Mr. Oliver, who supplies the following note: "The brown eel is perhaps the most common fish among rocks inshore. At Coral Bay it occurs under almost every stone in rock-pools. The power of seeing is limited, but that of smelling is well developed. A limpet, cut from its shell, will attract several of these hideous-looking eels. No sooner is one's hand in the water than one of these fishes, if near, darts at it and drives its powerful teeth through the flesh; in drawing back the hand, as one naturally does, the teeth cut their way out of the flesh. According to Mr. Roy Bell (one of the settlers on the Kermadec Islands), a pinch behind the head will have the effect of making the eel let go its hold: the eel evidently thinks another fish is attacking it."

Scombresox forsteri, Cuvier and Valenciennes.

The only specimen in the collection was washed on to the beach on the 1st July, 1908.

Machærope latispinis, Ogilby.

Previously known only from Lord Howe Island, we now have four examples from the Kermadec Islands, they having been washed up on to the beach at Sunday Island in August, 1908.

Seriola lalandii, Cuvier and Valenciennes.

Mr. Oliver states that the kingfish was often seen off the rocks, swimming solitarily or in parties of two or three. While out in the boat in Denham Bay on the 4th May, 1908, he saw a large school of young kingfish, averaging 22 in. in length, several of which were caught. Specimens were preserved for identification.

Caranx platessa, Cuvier and Valenciennes. (= *C. georgianus*, C. & V.)

According to Mr. Oliver, the trevalli is not common at the islands, and was caught on one or two occasions only, off the rocks and beach; the length of the largest example obtained was 640 mm.

Cubiceps gracilis, Lowe.

The specimens referred to this species are rather small for specific recognition, but they agree very closely with Günther's figures* of the smaller examples illustrated.

Schedophilus maculatus, Günther.

The largest of three specimens received measures 100 mm. in length, and the dark blotches on the body form four bands, the three anterior of which are double. In the specimen figured from Lord Howe Island† the tail was imperfect, and was indicated as supposedly rounded; the present examples show it to be emarginate, and about one-fifth the length of the head and body.

Pempheris analis, sp. nov. Plate XXXVI.

B. VII; D. VI, 9; A. III, 31-34; V. I, 5; P. 16; C. 17 + 6. L. lat. 69 + 18; L. tr. 13 + 23.

Length of head, 3.4; height of body, 2.4 in the length; diameter of eye, 2 in the head; interorbital, 1.6; snout, 3.1 in the eye.

* Günther, Chall. Rep., xxxi, 1889, pl. ii, figs. B and C.

† Waite, Rec. Aust. Mus., v. 1904, pl. xx, fig. 1.

The maxilla is slightly longer than the diameter of the eye, is greatly expanded behind, its distal extremity being one-third the diameter of the eye, and extending slightly beyond its centre. Two small flat spines at the angle of the premaxilla. The cleft of the mouth is nearer the vertical than horizontal, and at its angle on the outside of the mandible there is a fatty body, resembling a luminous organ; this is only visible when the mouth is open.

A narrow band of setiform teeth in the jaws, on the vomer and palatines.

The distance between the origin of the dorsal fin and the end of the snout is slightly less than one-half that between its origin and the tip of the middle rays of the caudal; the first soft ray is the longest, 1.2 in the head, and longer than the base of the fin, which is 1.4 in the same. The anal fin commences beneath the middle of the dorsal, and its base is an eye-diameter longer than the head. The pectoral is long, extending to the base of the first anal ray; its third ray is the longest, a little longer than the head less the snout; its lower rays diminish rapidly, the inferior ones being very short. The ventral does not quite reach to the anal. The upper lobe of the caudal appears to be the longer, due to its upper rays being nearly in the same line as the dorsal profile from the origin of the dorsal fin; the caudal is emarginate, and its length 1.4 in the head; the depth of the peduncle is equal to its length below.

Scales.—With the exception of the upper part of the snout, the whole of the head is covered with ctenoid scales similar to those of the body; the bases of the anal and caudal are clothed with smaller scales, which run up the interradial membranes for some distance. The lateral line follows the dorsal profile, and is continued along the middle of the caudal.

Colours.—Purplish-brown, not darker above than below, lower parts of head lighter, a golden spot behind the eye; dorsal, caudal, and paired fins yellow; anal grey; spines and tip of dorsal and axis and base of pectoral black; first few rays of anal also black.

Length, 189 mm. Nine specimens.

This species is very nearly allied to *P. oualensis*, Cuv. & Val.* (= *P. otaitensis*, Cuv. & Val.), differing mainly in the constant smaller number of rays in the anal; those of the latter species are rendered as 40–42 also by Günther,† and as 41 by Seale;‡ the maximum number found in *P. analis* is 34, and the minimum 31. Some slight proportional differences are also observable, but can be definitely ascertained only by direct comparison. The colour scheme appears to be identical, and specimens showing connection in the matter of the rays may some day be found.

Mr. Oliver informs me that all examples obtained were washed up on to Denham Bay beach on several occasions between May and September, 1908; at one time fifteen were on the beach, but most of them were gnawed by rats.

Polyprion prognathus, Forster.

Though specimens of the groper were not preserved, I have no hesitation in including this species. Mr. Oliver not only identified it himself, but he made a description which enables me to confirm his statement. He supplies notes of two specimens caught, one in March and the other in September, 1908.

* Cuvier and Valenciennes, *Hist. Nat. Poiss.*, vii, 1831, pp. 299, 304.

† Günther, *Cat. Fish. Brit. Mus.*, ii, 1860, p. 508.

‡ Seale, *Occ. Papers Bern. Bishop Mus.*, i, 1901, p. 74.

Trachypoma macracanthus, Günther.

The collection contains two examples, the larger of which, measuring 228 mm. in length, was taken off the rocks at Sunday Island by hook and line. It is thus much larger than the type, which measured 180 mm. Both examples agree absolutely in structure with the diagnosis and figure of the species,* but differ in coloration. Instead of being uniform, the head and body are mottled with brown, and, though the specimens agree, the markings are better defined in the smaller fish, which is 110 mm. long. The top of the head is brown, and there is a V-shaped mark on the cheek, the front limb of which lies below the eye; there are four irregular brown blotches across the back, one in advance of the dorsal, a second at the base of the last six spines, a third below the middle of the rays, and the fourth across the base of the caudal; the blotches beneath the fins are also continued some distance up their bases; a brown band passes from the snout behind the eye, and is represented along the lateral line by a series of large irregular blotches, which are generally alternate with the dorsal marks. The characteristic spots, which, as I know from fresh specimens collected at Lord Howe Island, are blue in life, are not very apparent in the Kermadec Island examples, but may be traced on the fins, and faintly on the body in places; they would be doubtless more conspicuous when the fish was alive.

This species is now known from Norfolk Island (the type locality), Lord Howe, and the Kermadec Islands.

Acanthistius cinctus, Günther.

The largest example brought from the island measures 330 mm. in length. Mr. Oliver says that it is very common among rocks all round the coast, and is greedy, and easily caught.

Arripis trutta, Forster.

The kahawai is extremely common at the islands, and Mr. Oliver says that during the months of September and October they literally swarmed round the island, feeding on a small crustacean; on the 8th September, when Denham Bay was crowded with kahawai, many were caught, and the stomachs of all were full of the crustaceans. Examples caught in April were in roe. Two specimens were preserved for examination.

Girella cyanea, Macleay.

I referred several small specimens to this common Lord Howe Island species, but, as they showed some slight differences, I referred them to Mr. A. R. McCulloch, of the Australian Museum, for the purpose of comparing them with the examples we together collected there in 1902-3. He says that, compared with specimens of the same size, they differ only by having the ventrals reaching nearly to the vent, whereas in all others they fall short of it. He adds that the Lord Howe Island examples show some variation in this respect, and he would regard the Kermadec Island examples as referable to this species. The life colours as described by Mr. Oliver are exactly those of *Girella cyanea*.

Scorpis æquipinnis, Richardson.

This Australian species, known also from Lord Howe Island, differs from the New Zealand *S. violaceus*, Hutton, by its larger scales. Three small examples were collected on Sunday Island.

* Boulenger, Cat. Fish. Brit. Mus. (2), i, 1895, p. 146, pl. ii.

Atypichthys strigatus, Günther.

Of this widely distributed species we have three examples from the Kermadec Islands. Mr. Oliver states that they are common among rocks all round the coast.

Goniistius gibbosus, Richardson.

The distinguishing features of the members of the genus *Goniistius* have not yet been clearly expressed, and await investigation at the hands of some worker with a representative series. The only example received from the islands is in fair agreement with Steindachner's figure,* but the oblique bands are not so well defined, and the last, or eighth, band does not run on to the tail; the anal fin, also, is black. The rays of the dorsal fin number XVII, 33; those of the anal III, 8. The specimen measures 221 mm. in length.

Chironemus marmoratus, Günther.

Several specimens, taken among rocks.

Chromis, sp.

The only member of the *Pomacentridæ* secured is a scaleless and otherwise mutilated specimen found on the beach. It is not possible to identify it specifically, but the following characters may be mentioned: Body less than half the length; second anal spine very long and strong, longer than the longest dorsal spine; pectoral longer than the head, and one-third the length of the body; tail long and deeply forked, its lobes acute; the caudal peduncle is slender, its depth one-third greater than the diameter of the eye. It is not possible to ascertain the coloration, but traces of orange exist about the opercles and at the bases of the fins. The length of the specimen is 160 mm.

Pseudolabrus inscriptus, Richardson.

Previously recorded from Raoul Island.

Pseudolabrus luculentus, Richardson.

Represented by small examples taken from rock-pools.

Cantherines analis, Waite.

Pseudomonacanthus analis, Waite. Rec. Aust. Mus., v, 1904, p. 173, fig. 32.

I associated with this species an example obtained at Sunday Island, but noted differences in respect to the situation of the gill-opening and the pectoral. The type being preserved in the Australian Museum, I forwarded the specimen to Mr. McCulloch, who kindly writes as follows: "The specimen is undoubtedly *Pseudomonacanthus analis*. The type, as you will remember, is imperfect and beach-worn, and the positions of the gill-opening and pectoral are consequently not quite correctly shown in the figure. The small black spots seen in the Kermadec Island specimen may be traced in the type."

In my paper I made comparison with *P. degeni*, Regan,† and now, having an example for direct comparison, Mr. McCulloch writes, "*P. degeni* is much more slender than *P. analis*, the caudal peduncle is longer, and the spine is over the hinder margin, and not over the middle of the eye."

* Steindachner and Döderlein, *Fische Japans*, ii, 1883, pl. vii, fig. 2.

† Regan, *Proc. Zool. Soc.*, 1902, p. 299, pl. xxiv, fig. 1.

As the present example is in perfect condition, the original description may be amended and amplified as follows :—

D. II, 35; A. 32; P. 12; C. 12.

The upper edge of the gill-opening stands under the middle of the eye, and the insertion of the pectoral is beneath the same point. As in the type specimen, the dorsal spine is also broken; the existing portion measures one-half the length of the snout.

The colour and markings are as previously described, but in addition the upper part of the body and caudal peduncle are ornamented with closely set small black spots, which do not extend below the mid-line of the body.

The specimen is somewhat larger than the type, being 280 mm. in length.

Sphæroides oblongus, Bloch.

Represented by one specimen only.

Canthigaster caudofasciatus, Günther.

Two little examples received, which measure but 31 mm. and 33 mm. in length respectively. The smaller one is colourless, but the other exactly resembles Steindachner's figure.* This author regards *Tetrodon callisternis*, Ogilby, as the same species. *C. caudofasciatus* is identified from Laysan, while *C. callisternis* was described from examples collected on Lord Howe Island. My little specimens do not enable me to form any opinion on the identity of the two forms.

Diodon hystrix, Linnæus.

Among the specimens washed on to Denham Bay beach are two little Diodons, measuring respectively 27 mm. and 12 mm. in length. They have been referred to *D. hystrix*, because it is not possible in such small specimens to find characters which may be distinctive, and which in adult examples may be of doubtful value.

Scorpæna cooki, Günther.

Jordan and Evermann† state that the illustration made by Garrett, and published by Gunther as *S. cooki*, was from an Hawaiian species—*S. cacopsis*, Jenkins—the description only referring to the Raoul or Kermadec Island species.

Mr. Oliver informs me that this fish, two examples of which he submitted for determination, is not uncommon on rocky bottoms, and was occasionally caught. The largest specimen secured measured 475 mm.

Pterois volitans, Linnæus.

Mr. Oliver writes, "Only a single specimen was taken, being obtained with a scoop net in the boat-harbour at Meyer Island on the 24th April, 1908. It is a most gorgeously coloured fish, which moved along very slowly, near the bottom, and allowed itself to be driven to a corner, where it was netted. Evidently it was conscious of the terrible weapons it possessed in its spines, and made but a feeble attempt to escape. I take it to be a good case of warning coloration."

Limnichthys fasciatus, Waite.

Mr. Oliver's collection contains several examples of this species, taken in rock-pools, and also dredged from 5 fathoms at Sunday Island. They

* Steindachner, Denk. d. k. Akad. Wiss., Wien, lxx, 1900, pl. iii, fig. 3.

† Jordan and Evermann, Bull. U.S. Fish. Comm., xxiii, 1905, p. 468.

show some diversity in colour-pattern, the number of cross-bands varying from seven to ten. In most cases these bands unite on the lateral line and form a longitudinal stripe, the whole of the body below this being without markings. All the structural characters agree with the type.

Alticus, sp., and *Salarias*, sp.

Examples of these two genera have not been specifically determined.

(?) *Petroscirtes rhynorhynchus*, Bleeker.

A small example, 48 mm. in length, is provisionally referred to this species. It was dredged in 12 fathoms, off Meyer Island.

NORFOLK ISLAND.

The first fish recorded from Norfolk Island appears to be *Cichla cultrata*. Forster,* obtained during Cook's second voyage, 10th October, 1774. In Forster's "Descriptiones Animalium"† there is a list of fishes taken between New Caledonia and Norfolk Island, but the same species, under the name *Sciæna cultrata*, is the only one recorded from Norfolk Island (p. 292). Richardson added a few species, all of which, with the exception of *Muræna nubila*, are included in Bleeker's list, given below.

The first collected list of fishes from Norfolk Island is that by Bleeker,‡ who enumerates the following species:—

—	Recognition.
1. <i>Centropistes salar</i> , Richds. = <i>Arripis salar</i> , Richds.	<i>Arripis trutta</i> , Forster.
2. <i>Lethrinus chrystomus</i> , Richds.	<i>Lethrinus chrystomus</i> , Rich.
3. <i>Psettus argenteus</i> , Richds. = <i>Chatodon argenteus</i> , L.	<i>Monodactylus argenteus</i> , Linn.
4. <i>Cybiium clupeioidem</i> , Cv. = <i>Scomber clupeioides</i> , Brouss.	(?)
5. <i>Seriola cultrata</i> , Richds. = <i>Sciæna cultrata</i> , G. Forst. = <i>Cichla cultrata</i> , Bl. Schn. = <i>Scomber clupeioides</i> , Shaw. (An forte ead. ac. <i>Tybiium clupeioidem</i> , Cv. ?)	<i>Bathystethus cultratus</i> , Forster.
6. <i>Tautoga inscripta</i> , Richds. = <i>Labrus inscriptus</i> , Richds.	<i>Pseudolabrus inscriptus</i> , Rich.
7. <i>Tautoga luculenta</i> , Richds. = <i>Labrus luculentus</i> , Richds.	<i>Pseudolabrus luculentus</i> , Rich.
8. <i>Chanos salmonæus</i> , Cv. = <i>Mugil salmonæus</i> , J. R. Forst. = <i>Mugil lavaretoïdes</i> , Sol. = <i>Lutodeira salmonæa</i> , Richds. = <i>Leuciscus</i> (<i>Ptycholepis</i>) <i>salmonæus</i> , Richds.	<i>Chanos chanos</i> , Forskal.

* Bloch and Schneider, Syst. Ichth., 1801, p. 343.

† Ed. Lichenstein, 1844, p. 280 *et seq.*

‡ Bleeker, Verhand. der Koninkl. Akad. van Wetens. 1855.

Günther* added other genera and species (*Trachypoma macracanthus*, *Scorpaena cooki*, *Peltorhamphus novæ-zealandiæ*); and in 1887 Ogilby† examined a small collection of eight species, and described two as new (*Apogon norfolcensis* and *Coris trimaculatus*). He‡ later described a new mullet under the name *Cestreaus norfolcensis*. I§ have previously referred to Richardson's record of a spotted *Oplegnathus* from Norfolk Island, which he had seen at the Museum at Fort Pitt, and which he mentions in writing of *Oplegnathus punctatus*.|| The fish referred to has not since been noted at Norfolk Island. Jordan and Fowler¶ supply the data respecting Castelnau's genus and species, which at the time I wrote were unknown to me. The reference is as follows: *Ichthyorhamphos*, Castelnau, Poiss. Afrique Austr. (date 1855), p. 35 (pappei).

Some years ago, when in Sydney, I made a rough list of the fishes of Norfolk Island, based on collections made for or by Dr. Metcalfe, Messrs. Wetherall, Nobbs, and Quintal. This list is a quite unsatisfactory one, but, as I cannot now refer to the specimens, I simply print it as it stands; it will serve as a basis for future work, when the specific gaps can be filled in and new records added. Mr. McCulloch tells me that he has received *Mugil dobula* (? *M. cephalus*) from an inland stream which has been cut off from the sea for six years. This is the only species added to my original list.

Chanos chanos, Forskal.
Anguilla australis, Richardson.
Gymnothorax nubilus, Richardson.
Hyporhamphus intermedius, Cantor.
Scombresox forsteri, Cuvier and Valenciennes.
 (?) *Mugil cephalus*, Linnæus.
Myxus elongatus, Günther.
Agonostomus.
Cestreaus norfolcensis, Ogilby.
 (?) *Cybiium clepcoideum*, Broussonet.
Caranx plattessa, Cuvier and Valenciennes.
Bathystethus cultratus, Forster.
Amia novæ-guinea, Günther.
Epinephelus demeli, Günther. (Recorded by Boulenger.**)
Trachypoma macracanthus, Günther.
Acanthistius cinctus, Günther.

Cypselichthys japonicus, Doderlein.
Oplegnathus, sp. (Richardson).
Pagrus auratus, Forster.
Lethrinus chrysostomus, Richardson.
Girella.
Monodactylus argenteus, Linnæus.
Scorpis æquipinnis, Richardson.
Aplodactylus.
Chironemus marmoratus, Günther.
Chromis.
Parma polylepis, Günther.
Glyphisodon.
Thalassoma lunaris, Linnæus.
Coris trimaculata, Ogilby.
Pseudolabrus inscriptus, Richardson.
Pseudolabrus luculentus, Richardson.
Chilomycterus.
Peltorhamphus novæ-zealandiæ, Günther.

LORD HOWE ISLAND.

The fishes of Lord Howe Island have received much more attention, principally at the hands of Mr. J. D. Ogilby and myself. The list published

* Günther, Cat. Fish. Brit. Mus., and Fische der Mus. Godeffroy.

† Ogilby, Proc. Linn. Soc. N.S.W. (2), ii, 1887, p. 990.

‡ *Id.*, *ib.*, xxii, 1897, p. 80.

§ Waite, Rec. Aust. Mus., iii, 1900, p. 215.

|| Richardson, Rep. Brit. Assoc., 1845, p. 247.

¶ Jordan and Fowler, Proc. U.S. Nat. Mus., xxv, 1902, p. 76.

** Boulenger, Cat. Fish. Brit. Mus. (2), i, 1895, p. 224.

by the former in 1889* contained eighty-eight species, while mine, issued fifteen years later,† embraced 180 species.

COMPARISON OF GENERA.

The following table includes all the genera (see the note at end of next page) recorded from the Kermadec and Norfolk Islands, and in the column headed "Lord Howe Island" only these genera are tabled. The complete list has been referred to above.

Genus.	Kermadec Islands.	Norfolk Island.	Lord Howe Island.
<i>Carcharias</i>	X	..	X
<i>Chanos</i>	..	X	..
<i>Lampanyctus</i>	X	..	..
<i>Gonostomus</i>	X	..	..
<i>Lestidium</i>	X	..	..
<i>Gonorhynchus</i>	X	..	X
<i>Anguilla</i>	..	X	X
<i>Leptocephalus</i>	..	..	X
<i>Congrellus</i>	X	..	X
<i>Atopichthys</i>	X	..	X
<i>Murænichthys</i>	X	..	X
<i>Gymnothorax</i>	X	X	X
<i>Hyporhamphus</i>	..	X	X
<i>Scombrosox</i>	X	..	X
<i>Mugil</i>	..	X	..
<i>Myxus</i>	..	X	X
<i>Agonostomus</i>	..	X	..
<i>Cestræus</i>	..	X	..
(?) <i>Cybirum</i>	..	X	..
<i>Machærope</i>	X	..	X
<i>Seriola</i>	X	..	X
<i>Caranx</i>	X	X	X
<i>Bathystethus</i>	..	X	X
<i>Cubiceps</i>	X	..	X
<i>Schedophilus</i>	X	..	X
<i>Pempheris</i>	X	..	..
<i>Amia</i>	..	X	X
<i>Epinephelus</i>	..	X	X
<i>Polyprion</i>	X	..	..
<i>Trachypoma</i>	..	X	X
<i>Acanthistius</i>	X	X	X
<i>Arripis</i>	X	X	X
<i>Cypselichthys</i>	..	X	..
<i>Oplegnathus</i>	..	X	..
<i>Pagrus</i>	..	X	X
<i>Lethrinus</i>	..	X	X
<i>Girella</i>	X	X	X

* Ogilby, Mem. Aust. Mus., ii, 1889, p. 52.

† Waite, Rec. Aust. Mus., v, 1904, p. 187.

COMPARISON OF GENERA—continued.

Genus.				Kermadec Islands.	Norfolk Island.	Lord Howe Island.
<i>Monodactylus</i>	..	..	..	..	X	..
<i>Scorpiis</i>	..	..	..	X	X	X
<i>Atypichthys</i>	..	..	..	X	..	X
<i>Goniistius</i>	..	..	..	X	..	X
<i>Aplodactylus</i>	..	..	..	..	X	X
<i>Chironemus</i>	..	..	..	X	X	X
<i>Chromis</i>	..	..	..	X	X	X
<i>Parma</i>	..	..	..	..	X	X
<i>Glyphisodon</i>	..	..	..	..	X	X
<i>Halichæres</i>	..	..	..	..	..	X
<i>Thalassoma</i>	..	..	..	..	X	X
<i>Coris</i>	..	..	..	..	X	X
<i>Pseudolabrus</i>	..	..	..	X	X	X
<i>Cantherines</i>	..	..	..	X	..	X
<i>Sphaeroides</i>	..	..	..	X	..	X
<i>Canthigaster</i>	..	..	..	X	..	..
<i>Diodon</i>	..	..	..	X	..	X
<i>Chilomycterus</i>	..	..	..	..	X	..
<i>Scorpaena</i>	..	..	..	X	..	X
<i>Pterois</i>	..	..	..	X	..	X
<i>Limnichthys</i>	..	..	..	X	..	X
<i>Alicus</i>	..	..	..	X	..	X
<i>Salarias</i>	..	..	..	X	..	X
<i>Petroscirtes</i>	..	..	..	X	..	X
<i>Peltorhamphus</i>	..	..	..	..	X	..

The following genera were represented at Stations 170 or 170A of the "Challenger" Expedition, when the trawl was lowered off the Kermadec Islands in 520 and 630 fathoms: *Macrurus* (four species), *Bathygadus*, *Gonostoma*, *Bathypterois*, *Scopeus*, also "pilot-fish." As, however, no deep-sea investigations were conducted off Norfolk or Lord Howe Islands, these genera are not included in the comparative list.

EXPLANATION OF PLATES XXXV AND XXXVI.

PLATE XXXV.

Fig. 1. *Gonostoma raoulensis*, sp. nov.Fig. 2. *Murcnichthys oliveri*, sp. nov.

PLATE XXXVI.

Pempheris analis, sp. nov.